

**TBPOC CONFERENCE CALL
April 22, 2013, 4:00pm – 5:00pm**

Topic		Presenter	Time	Desired Outcome
1. CHAIR'S REPORT		S. Heminger, BATA		Information
2. PROGRAM ISSUES				
a. Seismic Safety Peer Review Panel Response to Benicia-Martinez Report***		A.Fremier, BATA	15 min	Information
b. Legislative Leadership Briefing		S. Heminger, BATA	10 min	Information
3. SAN FRANCISCO-OAKLAND BAY BRIDGE UPDATES				
a. Status Update on Anchor Rods*		T. Anziano, CT	35 min	Information
4. OTHER BUSINESS				
<p>Next TBPOC Meeting: May 1, 2013, 2:00pm – 5:00pm 1120 N Street, Sacramento, CA</p>				

* Attachments

** Attachments at end of binder

*** Attachments to be sent under separate cover

ITEM 1: CHAIR'S REPORT

No Attachments

Memorandum

TO: Toll Bridge Program Oversight Committee (TBPOC) **DATE:** April 22, 2013

FR: Steve Heminger, TBPOC Chair, Executive Director, MTC/BATA

RE: Agenda No. - 2b
Program Issues
Item- Legislative Leadership Briefing

Recommendation:

For Information Only

Cost:

N/A

Schedule Impacts:

N/A

Discussion:

A verbal legislative leadership briefing will be provided at the TBPOC April 22, 2013 conference call.

Attachment(s):

N/A

Memorandum

TO: Toll Bridge Program Oversight Committee (TBPOC) **DATE:** April 22, 2013

FR: Tony Anziano, Toll Bridge Program Manager, Caltrans

RE: Agenda No. - 3a
Program Issues
Item- Status Update on Anchor Rods

Recommendation:

For Information Only

Cost:

N/A

Schedule Impacts:

N/A

Discussion:

Attached is a draft "Briefing on E2 Anchor Bolts" for presentation to the BATA Oversight Committee on April 24, 2013.

Attachment(s):

Briefing on E2 Anchor Bolts – April 24, 2013

Briefing on E2 Anchor Bolts – April 24, 2013



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Toll Bridge Program Oversight Committee

- AB 144 established the ***Toll Bridge Program Oversight Committee***, composed of Director of the California Department of Transportation (Caltrans), and the Executive Directors of the California Transportation Commission (CTC) and the Bay Area Toll Authority (BATA), to be accountable for delivering the SRP.



MALCOLM DOUGHERTY
Director
California Department of
Transportation



STEVE HEMINGER
Executive Director
Bay Area Toll Authority



ANDRE BOUTROS
Executive Director
California Transportation
Commission



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Three Key Questions

1. What caused the E2 anchor bolts manufactured in 2008 to fail?
2. What retrofit strategy should be used to replace the 2008 anchor bolts?
3. Should the anchor bolts manufactured in 2010 be replaced?



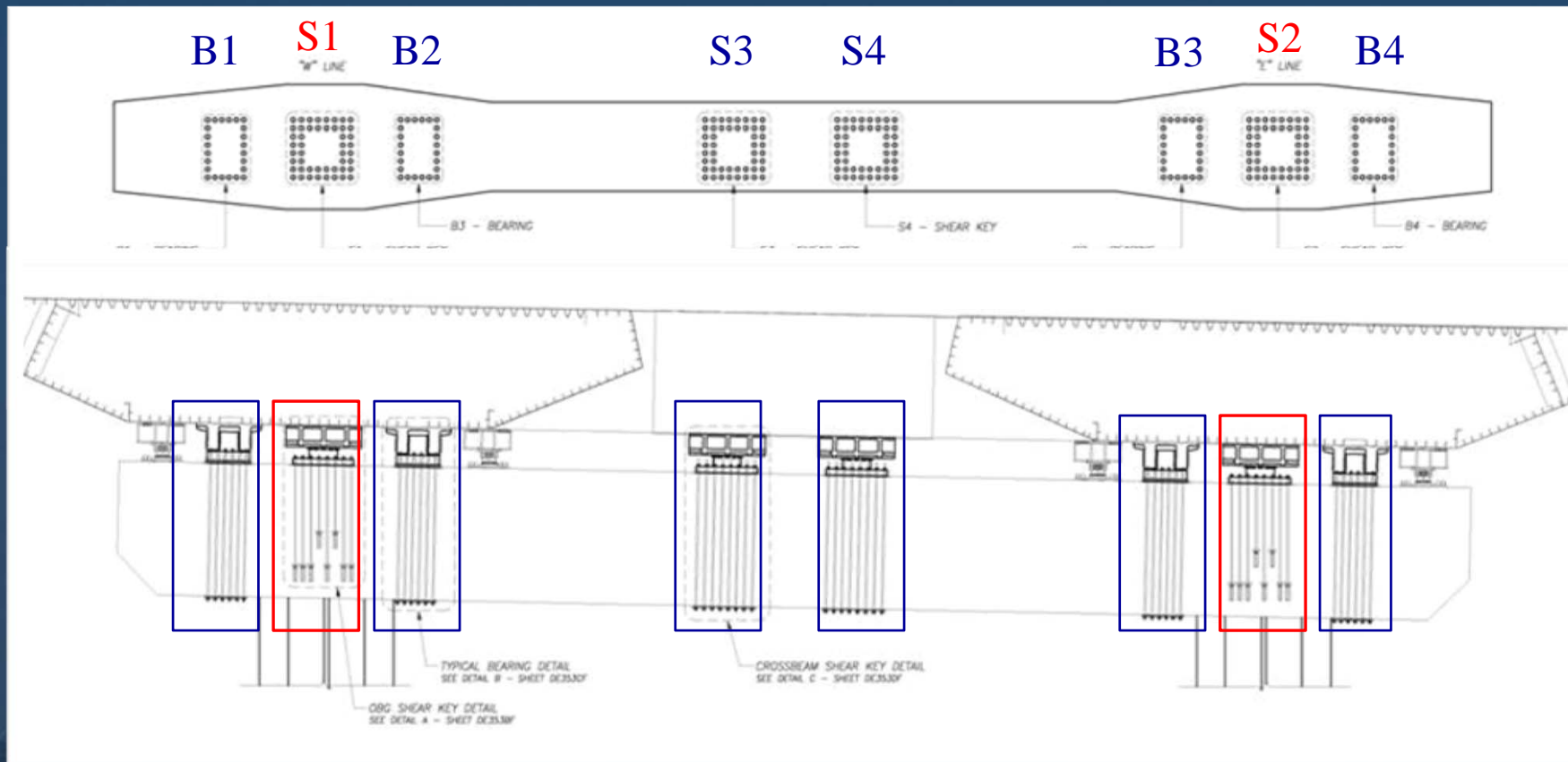
Pier E2

To be updated



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- Bearings and shear keys are secured to E2 by 3 inch diameter anchor bolts, ranging from 9 feet to 24 feet in length.
- 96 Bolts manufactured in 2008 are shown in red.
- 192 Bolts manufactured in 2010 are shown in blue.



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1. What caused the E2 anchor bolts manufactured in 2008 to fail?



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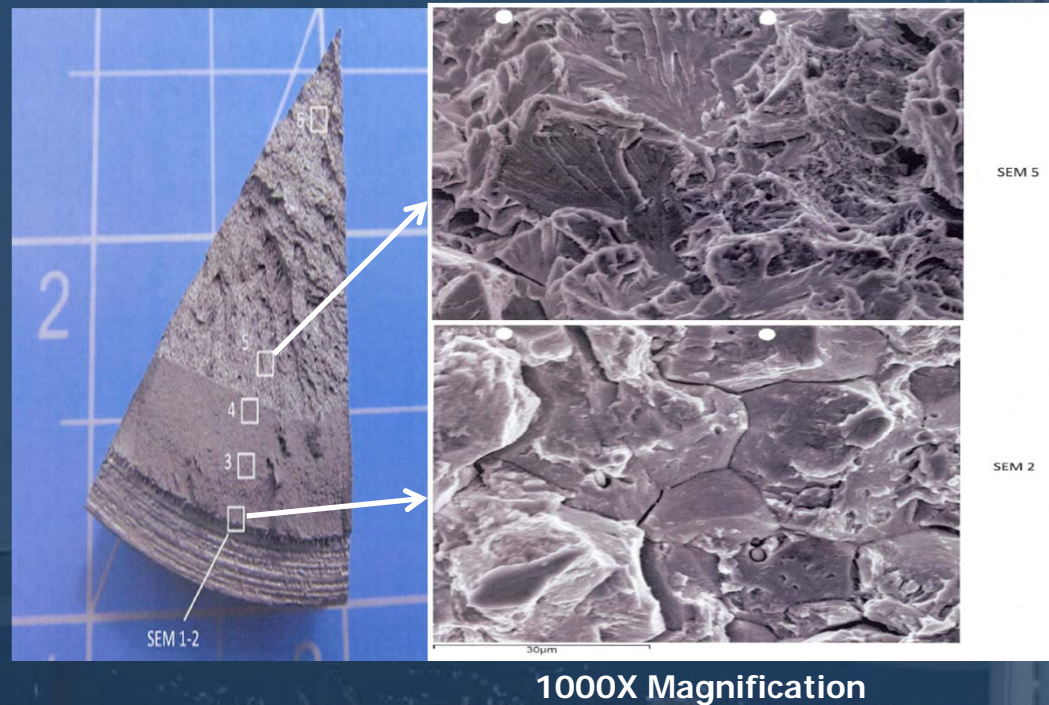
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Failure of 2008 Bolts Due to Hydrogen Embrittlement

- Under detail investigation, 2008 bolt failures are due to hydrogen embrittlement.
- Excess hydrogen in the 2008 bolts caused the threaded areas of bolts to become brittle and fracture under high tension.



Hydrogen Embrittlement



- Sources of excess hydrogen can be introduced in the fabrication and/or external from the environment.
- Identified under electron microscope.



Hydrogen Embrittlement

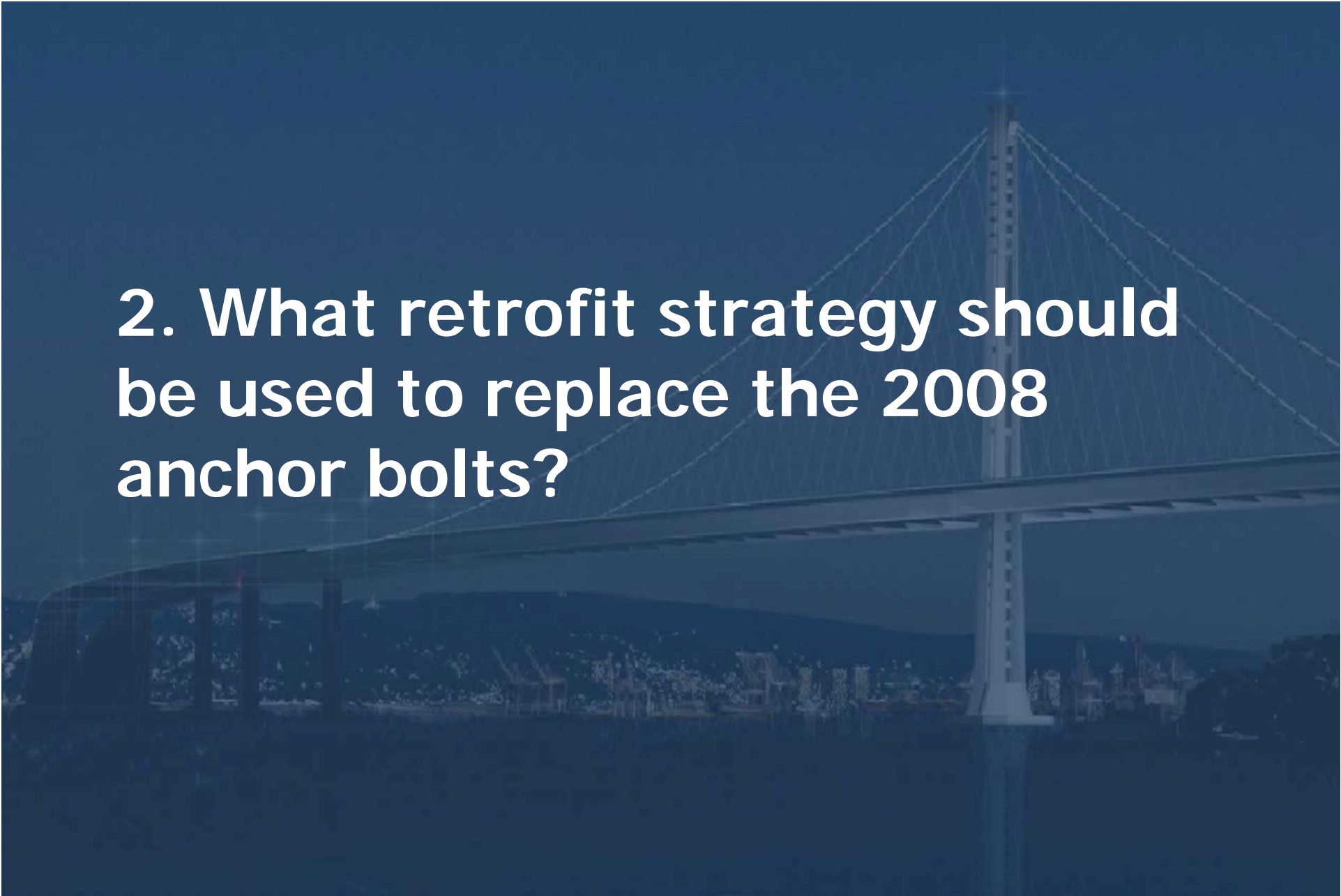
- Failure by hydrogen embrittlement is time dependent.
- Industry standard material testing protocols are not time dependent and would not necessarily identify problem.
- Additional testing protocols used during investigation will be applied to 2010 bolt investigation.
- Lessons learned – 3' bolts are not general hardware and additional care should be taken.



Address Media Points

- Address points raised by media bear no relevance to ability to identify hydrogen embrittlement.
 - Magnetic Particle Inspection
 - NCR's
 - Facility audits





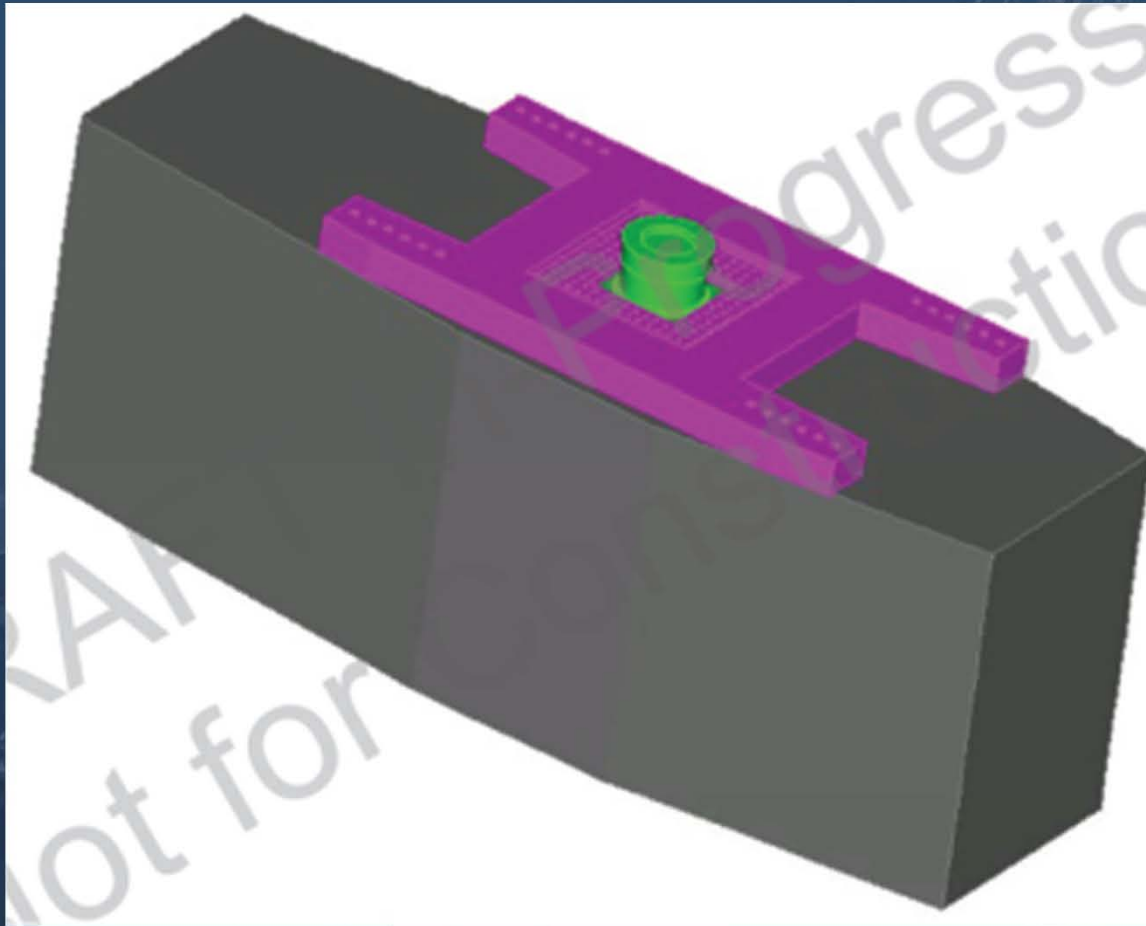
2. What retrofit strategy should be used to replace the 2008 anchor bolts?



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Option 1 – New External Anchor Bolts



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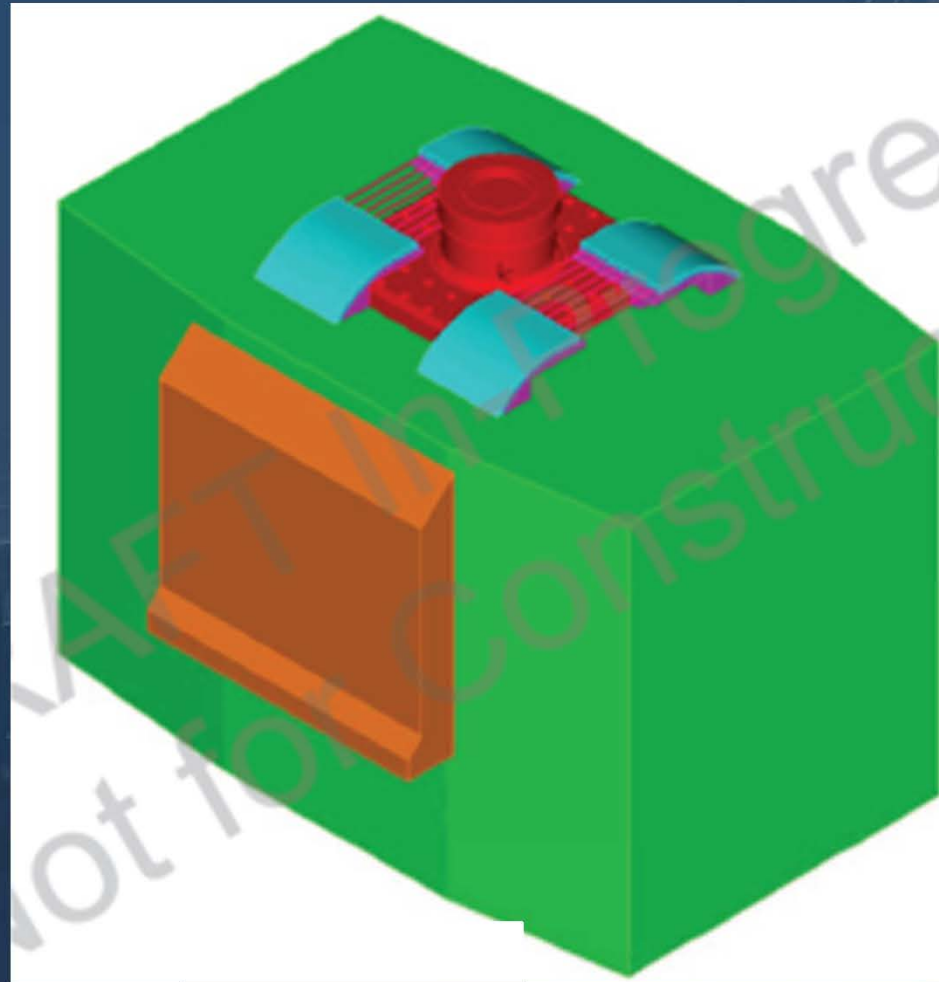
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15 APR 2013



Date: 2013-04-15
File Name: E2 SHEAR KEYS ANCHOR RODS RETROFIT - ALTERNATIVE B02 (1 of 1)

Option 2 – Post Tensioning Strands

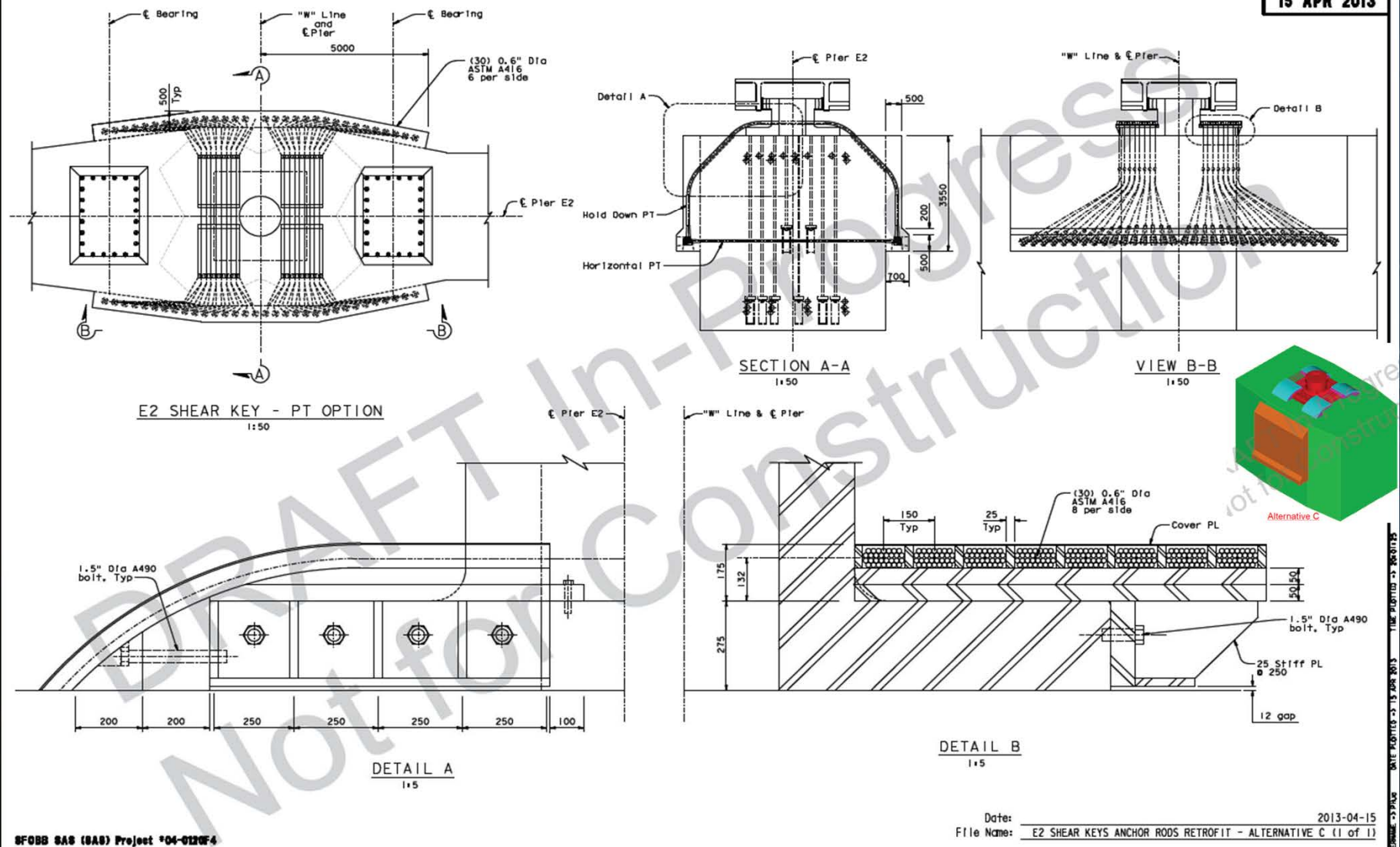


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Option 2 – Post Tensioning Strands

15 APR 2013



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General Comparison of Options

■ Option 1 – New External Anchor Bolts

Pro's

- No need to remove S1 and S2 shear keys
- Potentially simple to fabricate

Con's

- Need to find sufficient materials and resources
- More coring of E2 required

■ Option 2 – Post Tensioning Strands

Pro's

- No need to remove S1 and S2 shear keys
- Less coring E2 required
- PT Materials more readily available

Con's

- Requires unique saddle system.





3. Should the anchor bolts manufactured in 2010 be replaced?



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Differences

- After 15 to 25 days under tension, none of the 2010 bolts have failed.
- 2008 and 2010 bolts were manufactured 2 years apart using different Heats (batches) of steel.
- There were fewer material Heats used in the the 2010 bolts and less variation on the mechanical properties.
- 2010 bolts are not embedded in E2 pier cap.



Similarities

- Both 2008 and 2010 bolts originated from same principal supplier (Dyson Corp).
- Both sets of bolts were manufactured to the same specifications, including galvanizing.
- Both sets of bolts have been tightened to the same relatively high tension level.
- Both sets of bolts exhibit similar mechanical properties. (see next slide)



Post-Heat Treatment QC/QA Mechanical Tests

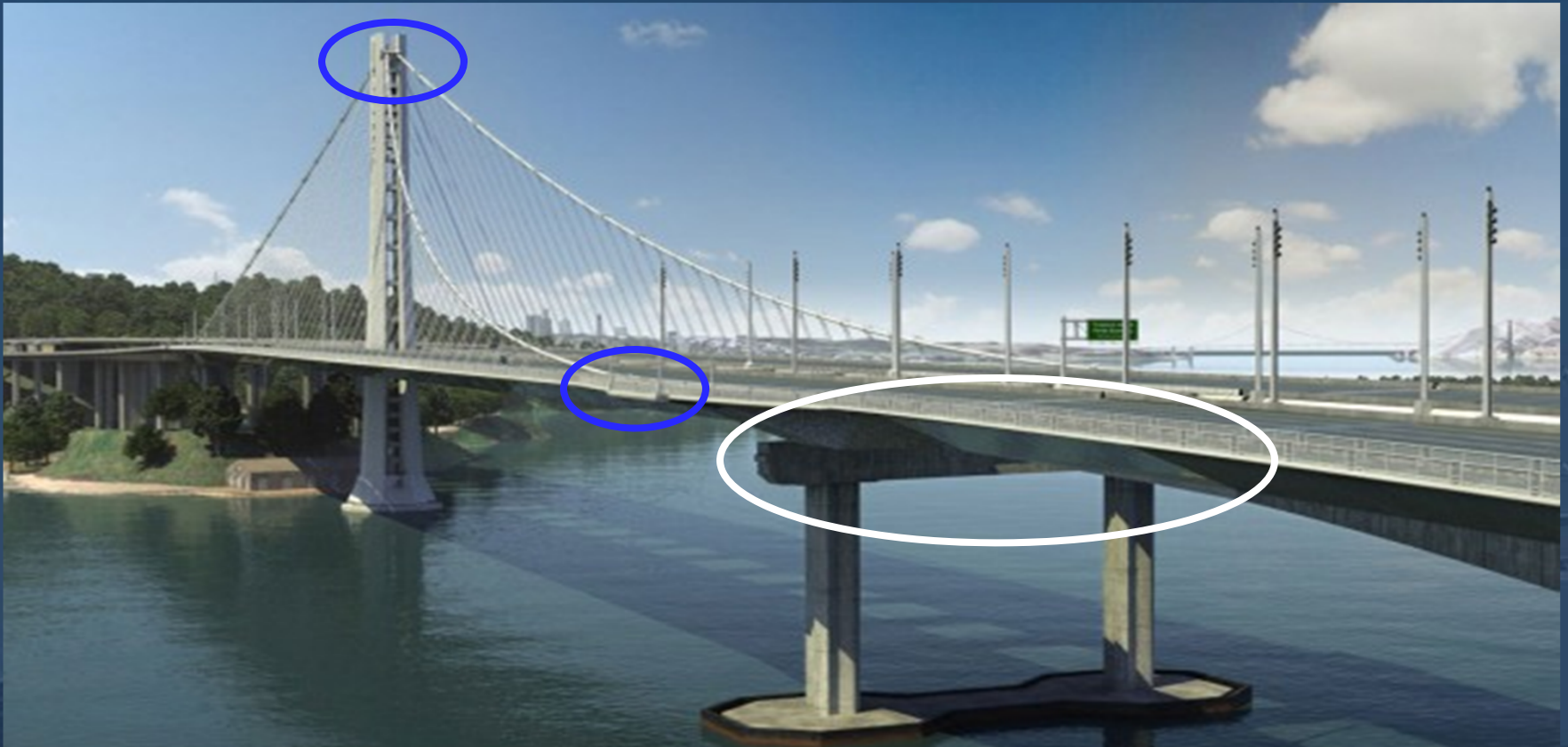
	Tensile (KSI)	Yield (KSI)	Elongation (%)	Reduction of Area (ROA)	Hardness (Rockwell C)
ASTM	140	115	14	40	31-39
2008 Average	159	143	14.2	48.4	36.4
2008 Min/Max	159/173	134/157	12.5/16	46/50	35/37
2010 Average	159	139	15.5	50.5	33.4
2010 Min/Max	153/165	132/146	13.2/16.8	40/55	33/35



Testing Protocol for 2010 Bolts

- **Current Contract Required Testing**
 - Tensile
 - Yield
 - Elongation
 - Reduction of Area
 - Hardness
- **New Additional Testing**
 - Tensioning the bolts in-situ to the required load for 30 days to allow the time dependent migration of hydrogen.
 - Tensile test of the full-size bolt through to fracture.
 - Toughness
 - Chemical Analysis
 - Microscopic examination by electron microscope
 - Micro-Structural examination to determine presence of hydrogen.





- Visual inspections of similar anchor bolts revealed no abnormalities.
- Some E2 Bearing assembly bolts are not accessible to inspection.
- Most anchor bolts at other locations are under lower tension levels.
- Desk Audit of QC/QA results will be completed by May 8.



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Summary (Draft)

- Failure of 2008 bolts was the result of hydrogen embrittlement.
- Two alternatives are still being evaluated.
- 2010 bolts are being tested with revised protocols.
- Desk audit of QA/QC results for similar bolts by same manufacturer will be completed shortly.



Items Expected at May 8th Briefing

- Selection of 2008 bolt retrofit solution, including cost and schedule impacts.
- Decision on whether to replace 2010 bolts and, if so, when.
- Completion of review of QA/QC results for other anchor bolt locations.



ITEM 4: OTHER BUSINESS

No Attachments